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Distribution Area and Yield Indicators of *Poa bulbosa* L. in Uzbekistan

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Abstract

The article is based on field research, existing literature, and samples of herbarium kept in the National Herbarium fund (TASH) *Poa bulbosa* L. The distribution maps and productivity indicators in the flora of Uzbekistan are presented. As you know, *Poa bulbosa* L. is considered the wild relative of cultural plants, as a forage plant, it is a plant with high protein value. In the course of research during 2021-2022, in 16 areas, the yield indicators of the species were determined. In the studied research areas, indicators of the total weight of plant bushes (on the account of wet mass) and, respectively, the volume of plant biomass (on the account of dry mass, the upper part of 25%) were determined. According to him, it was determined that the average yield of the plant the wet mass is 14669.8 kg/ha, and the average yield of the plant the dry mass in areas of total 244.0 ha in the total area is 63172.5 kg.

Keywords

Wild Relative, Distribution, Flora, *Poa bulbosa* L., Uzbekistan

1. Introduction

Wild relatives of cultivated plants (WRCP) are both the ancestors of crops and other species of varying degrees of proximity to these crops [1]. Wild relatives are an important source of disease, pest and stress resistance genes such as drought and extreme temperatures [2] [3]. Protection of wild relatives of crops allows for maintaining a sufficient level of genetic diversity of a separate crop [3] [4]. In recent years, the world has paid great attention to the study of wild relative cultural plants [5]. Wild relatives are valuable materials that can be used to adapt crops to changing environmental conditions and human needs, but a threat to the natural populations of wild relatives is growing steadily due to their overexploitation and the disappearance of growing sites [6]. The global project, launched in 2004, is funded by the Global Environment Fund, implemented by the United Nations Environment Programme, and provides cooperation to five countries—Armenia, Bolivia, Madagascar, Sri Lanka, and Uzbekistan, which have a significant number of valuable, threatened wild relatives of cultivated plants.

WRCP are carriers of valuable features and properties that are absent or mild in cultivated plants [7]. In connection with the development of biotechnology and molecular biology methods, the possibilities of involving wild species in breeding programs are expanding [8]. Many of the species from which the crop plants were selected continue to survive in the wild, even to the present day [9]. So also do their closely related species. Many wild relatives have evolved to survive droughts and floods, extreme heat and cold, and they have become adapted to cope with many natural hazards [10] [11]. They have often developed resistance to the pests and diseases that caused so much damage to the related crops [12].

Cultivated plants are the most important material basis for human survival and development. The growing global human population and personal demands result in increasing consumption of plant resources. The low genetic diversity of cultivated plants is a key factor that restricts production and quality improvements. Wild relatives of cultivated plants have accumulated rich genetic variations and adaptive traits during the process of long-term adaptive evolution, and thus can be used as genetic donors in germplasm innovation and improvement of cultivated plants [13] [14]. However, the persistence and evolution of wild relative populations are threatened by habitat destruction and anthropogenic climate change [15].

Representatives of the Poaceae family are considered to be widely and evenly distributed species worldwide [16]. Poaceae is a large and nearly ubiquitous family of monocotyledonous flowering plants known as grasses [17]. Representatives of this family are very common both in tropical countries and in countries with temperate climates. Representatives of this family have been used by the inhabitants of the world for several thousand centuries, in different sectors of the farm. Cereals are also widely used as fodder plants, especially by local residents. The taxonomic status of representatives of the family is quite perfect, and now it contains 5 - 6 small families. Polymorphic characteristics of representatives of the family are very high, we can also observe a number of their variations.

Poa bulbosa L., the largest genus of grasses (Poaceae) with over 575 species, occurs throughout temperate and boreal regions in both hemispheres [18] [19]. In Central Asia, 38 species are distributed, in Uzbekistan—26 species. 7 of them are wild relatives of cultivated plants. The research was carried out during 2021-2022 in National Herbarium (TASH) and different ecological conditions of Uzbekistan.

2. Material and Methods

In the performance of the study classical botanical research methods were used. The main method, used during the field research was route reconnaissance. The laboratory processing of the initial material was performed in strict accordance with all requirements, and the herbarium samples were stored in the Herbarium. The object of the study is *Poa bulbosa* L. [20]. Perennial 10 - 60 cm. Stems are a simple bulbous thickening (**Figure 1**).

Spikelet source is wide-ovate, thin-pointed. The lower flowering sources are 1.8 - 3.2 (3.6) mm long, with slightly visible venation, pubescent along the keel and lateral vein, in parts y is based with tufts of long hairs. Chromosome number: 2n = 14, 28, 39, 42, 45.

Poa bulbosa L. is an ephemeroid native cereal of the European and Mediterranean flora, after an accidental introduction in 1906 to the eastern states of the USA, it proved to be a highly competitive, aggressive invasive species, quickly spreading to the western coast of North America [21]. Among the many factors contributing to the expansion of the cereal in a new territory is its complex reproductive strategy. It can be propagated by seeds through amphimixis and apomixis, as well as vegetative-basal bulbs developing at the base of vegetative shoots, and bulbs (bulbules) formed in inflorescences with pseudo riparian. During the studies, based on samples collected from various botanical regions of Uzbekistan, the ontogenesis criteria of the species were determined. Distribution is on clay and sandy soils, on steppes, dry meadows, grassy slopes, and dry saline soils; on the plain, in the foothills, and mountains to the upper belt.

3. Result

The deterioration of environmental conditions and the acceleration of genetic erosion significantly increase the threat of extinction of the geological survey. In this regard, it is very relevant to study and preserve the gene pool of wild relatives of cultivated plants, including those that are rare, endangered species and native forms, their reproduction, and restoration. According to experts, in the last century, there has been an intensive process of genetic erosion in the gene pools of plants. The study of the influence of environmental factors and the collection of information in this area is very important. *Poa bulbosa* L. is an excellent forage plant in early spring pastures [22]. It is eaten by all kinds of cattle. It is cold-resistant and drought-resistant. It grows quickly after mowing and bleaching. It is grown in Russia and nearby countries, and America. *Poa bulbosa* L. is an indigenous cereal of the European and Mediterranean flora and an invasive species in North America. Currently, one of the components of global natural changes is the invasion of alien species into native ecosystems. It often entails negative consequences, since invasive species can bring infections to the developed territories, displace native plants from ecosystems and, ultimately, reduce biological diversity. In addition, invasive species, many of which are weeds, are capable of causing significant economic damage, significantly reducing crop yields. During the studies, initially, *Poa bulbosa* L. scattered areas and dialed

Figure 1. Ontogenesis of *Poa bulbosa* L.

herbarium samples were analyzed at the age of years (**Figure 2**). First, samples from the National Herbarium Foundation (TASH) were analyzed, as studies from 1900-2000, studies from 2001-2021, as well as in the section of the studies we conducted. Samples stored in the National Herbarium (TASH) fund of the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan show that up to now 413 samples of herbariums are kept here.

In addition to Uzbekistan, the fund also contains samples of herbariums from Tajikistan, Kyrgyzstan, Kazakhstan, Turkmenistan, Afghanistan, and Iran. *Poa bulbosa* L., kept in the National Herbarium (TASH) fund. Samples were dialed by Dimo and Minkvis in 1908 (**Figure 2**).

It is known that many studies have been carried out in Uzbekistan, both floristically and geobotanical. In these studies, Paa bulbasa L. a lot of information is also provided about the distribution of the in our flora. Even in the XX century, large-scale research was carried out in this direction. Over the years 1900-2000, more than 150 herbarium samples were collected. The width of the distribution area of the species can also be known through the points they meet (**Figure 3**).

The next analysis was formed based on the analysis of the research carried out over the past 20 years. In recent years, great attention has been paid to the study of the vegetation cover of Uzbekistan by scientists of the Institute of Botany of the Academy of Sciences Republic of Uzbekistan. Many monographs have also been published on this subject. A lot of research has been carried out on the study of plant communities, especially those distributed in the arid regions of Uzbekistan. It was during 2001-2021 that *Poa bulbosa* L. 143 is shown on the plot. The main share of these indicators falls on floristic and geobotanic accounts (**Figure 4**).

In total, 16 regions were studied during the studies conducted in 2022. These studies have identified fields of resource value. In these regions, there is the regular raising of livestock during the year (**Figure 5**).

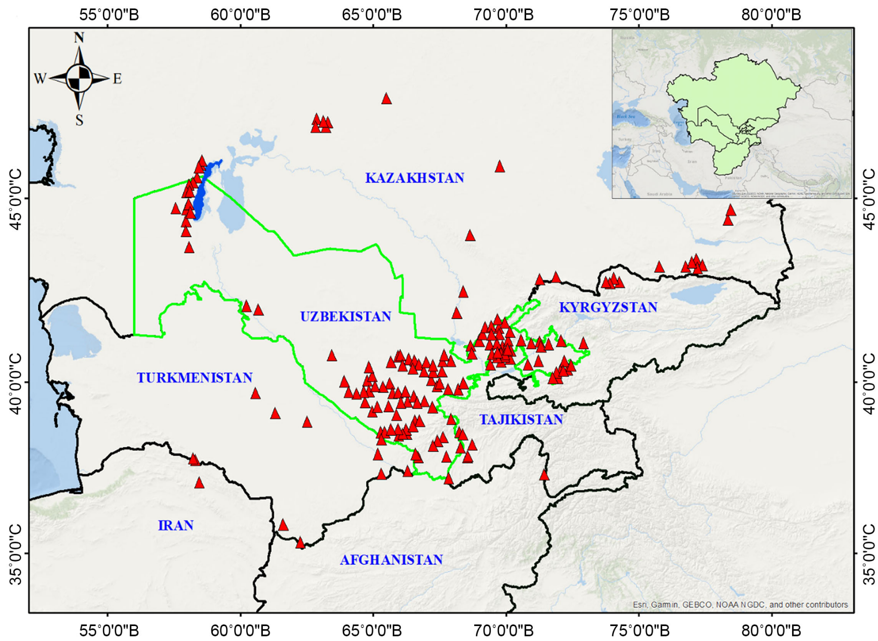

Figure 2. Herbarium specimens held in the stone fund (1900-2022).

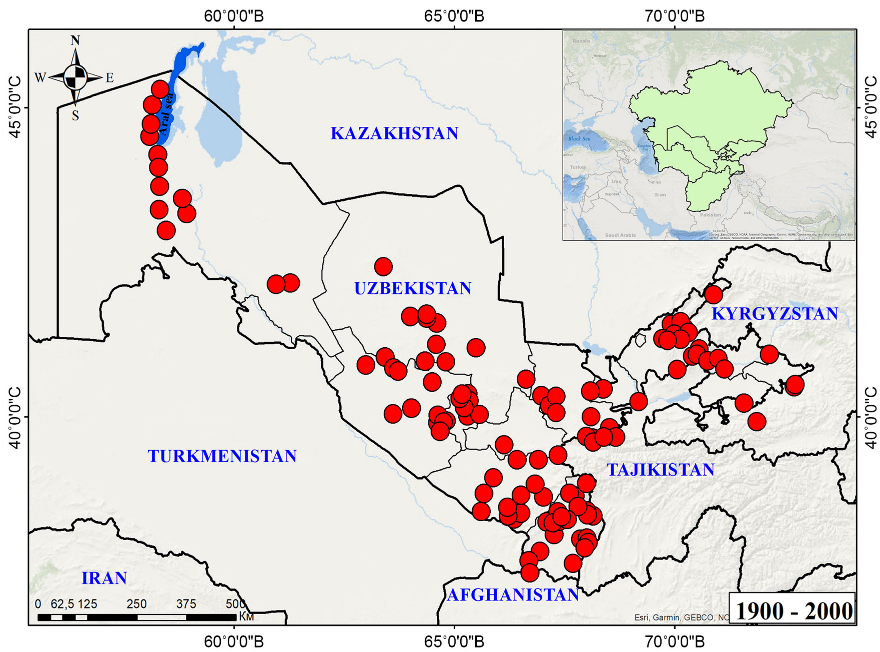

Figure 3. *Poa bulbosa* L., distributed in the flora of Uzbekistan (Data from 1900-2000).

The rapid increase in the population in world in pictures also leads to an increasing demand for agricultural products, in particular livestock products. The limitation of the feed base for livestock and especially the shortage of feed base for pasture livestock require the development of ways to effectively use existing natural pastures. At this point, one of the urgent problems is the identification of fodder plants in natural pastures, the widespread use of high-nutrient species and the establishment of measures to strengthen the livestock base.

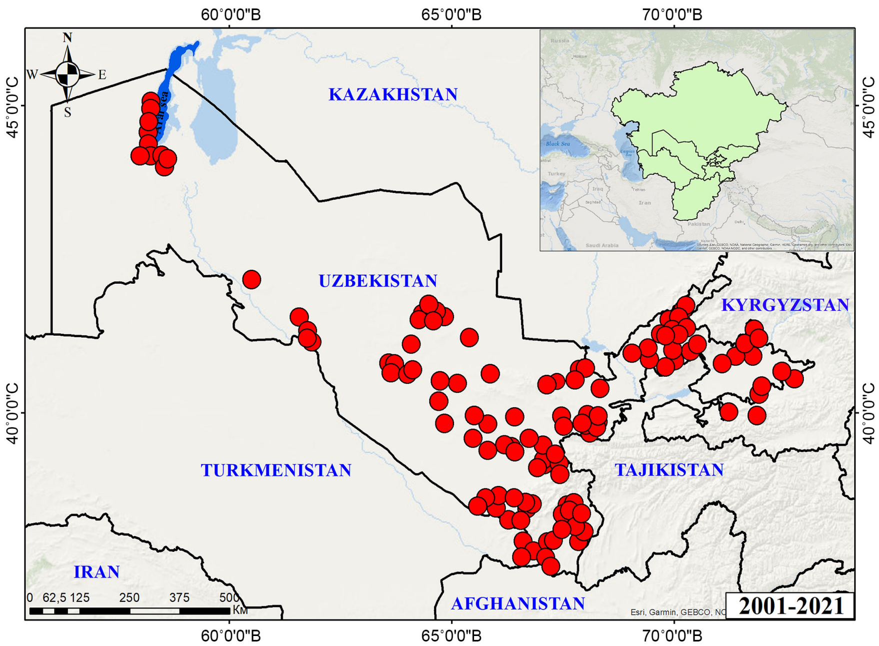

Figure 4. *Poa bulbosa* L., distributed in the flora of Uzbekistan (Data from 2001-2021).

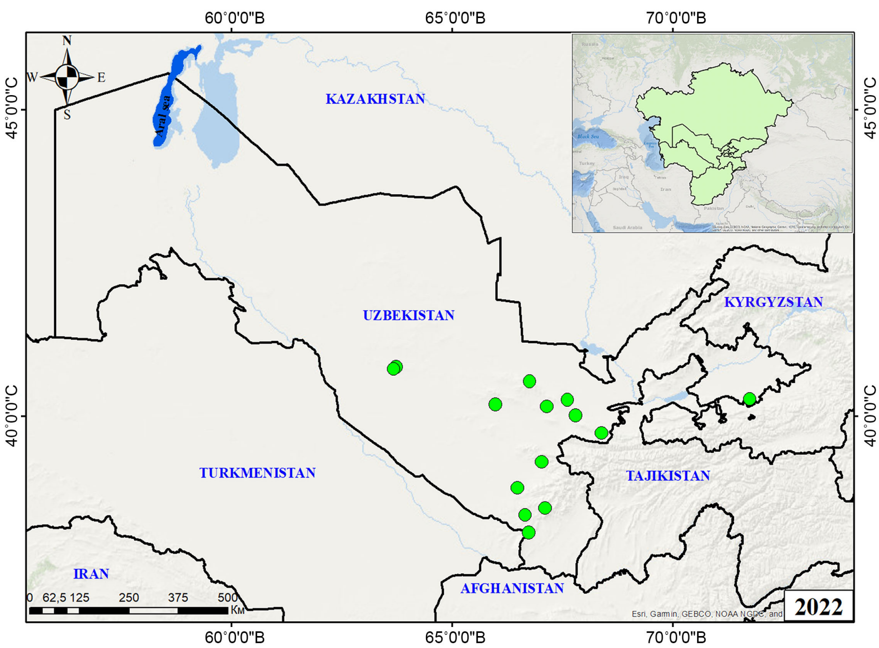

Figure 5. Study area (2022).

4. Discussion

Of particular economic importance are the wild ancestors of cultivated plants—the main source of genes for the quality, and quantity of agricultural products to green and reduce the risk of plant extinction. However, maintaining their natural population in optimal condition is not the only one of the wild relative of cultural plants (WRCP), and should be directed towards maintaining a whole system in which they spread. *Poa bulbosa* L.—it is one of the main fodder plants in the pastures of Uzbekistan. During the studies, the yield indicators of the species from 16 regions were determined. In these regions, it was observed that the species is in the dominant position in most cases (**Figure 6**).

Figure 6. Field work.

Determining the yield of plants of fodder importance allows them to be widely used. Our research was carried out in various botanical and geographical regions of Uzbekistan. During the studies, samples were taken in 16 areas, from each area 10 × 10, n − 10. These territories were taken from various administrative places. When determining the yield indicator of plants, indicators were obtained for the number of bushes, the weight of 1 Bush of the plant, the weight of the bushes in one hive, the area in which the species is distributed (to), the average yield (relative to the wet mass) per kg and the average yield in the total area (−25% compared to the dry mass) per kg (**Figure 7**).

The indicators of the reserve size of the plant in the section of the regions are detailed below. We will first mention the fields in which the species is distributed. During the studies, the area in which the species is distributed is a total of 244 hectares. The smallest of the fields is 2.5 hectares, while the largest is 50 hectares. The amount of productivity in these regions is 63172.5 kg. The crop yield was divided into 3 groups: upper, middle and lower. In this case, the average yield indicators in the total area were taken as the main character (**Figure 8**).

The result (**Figure 8**) of the research shows that in regions with high yields, the average yield was found to be higher than 10 tons. During the studies, samples were taken in an area of 10 × 10. The number of tubers in these regions and the weight of the tubers were taken. All the resulting tubers were shown in kg.

The first fields (1, 6) were determined from Turkestan ridge. This territory is bordered by the Republic of Tajikistan. The annual amount of precipitation in this area exceeds 500 mm in some years. This has a positive effect on the yield indicators of plants. In these regions (10 × 10), the number of tubers was observed to be around 163.5 - 229.8. The weight of one bush was also determined in exactly 6 areas. It was found that the total weight of one bush is around 70.4 grams. Accordingly, the highest yield was also observed precisely in this area (23222.0 kg).

Next areas (2, 3, 4, 5, 8) are separated from Gissar Ridge. This ridge is considered one of the largest in Central Asia. The Paleozoic and Mesozoic Era is composed of crystalline rocks, granodiorite, shales and sand-stones, gypsum, conglomerate, dolomite, etc., from which granite intrusions burst. It should be noted that in these regions there are large livestock farms of Uzbekistan. This further increases the demand for fodder plants. In these regions (10 × 10), the number of bushes was observed to be around 60.9 - 197.2 units. The lowest indicator was observed in Tarkapchigai botanical-geographical region. The soil of this land is ola-sex, plastered, and this condition also had its effect on their density.

The next areas were separated from the Nurata range and its surroundings (7, 9, 14, 15). The 14 area was very close to the settlements, and regular livestock feeding was observed throughout the year. This situation is also reflected in the number of bushes in area 10 × 10, which is 41.9. It was found that the biomass of tubers also has a very small value (29.6). Areas 7 and 15 are separated from mountainous areas, and the number of tubers in an area of 10 × 10 is 137.3 - 164.8. It has been observed that the biomass of tubers is also around 54.4 - 65.3 grams.

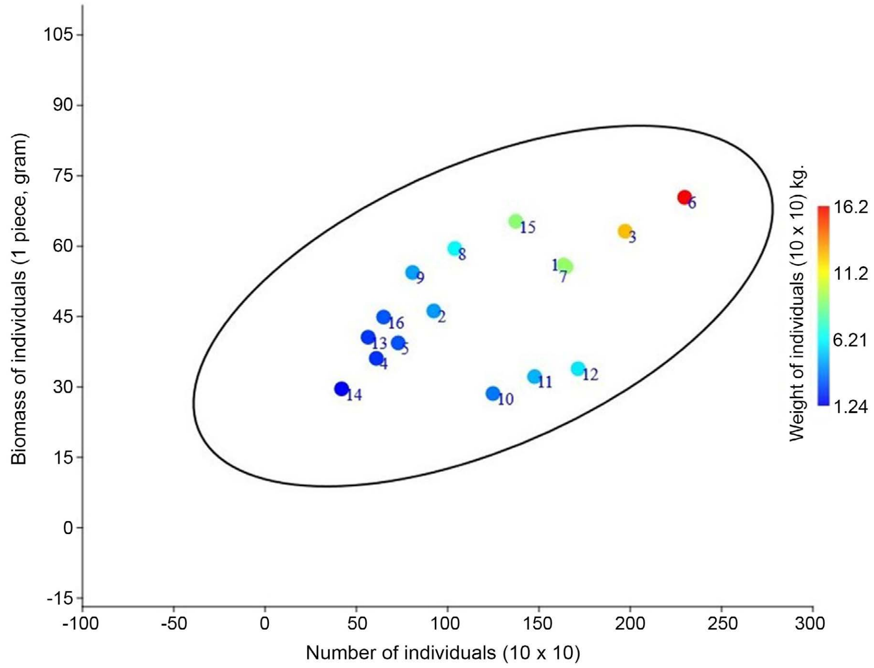

Figure 7. Biomass of individuals.

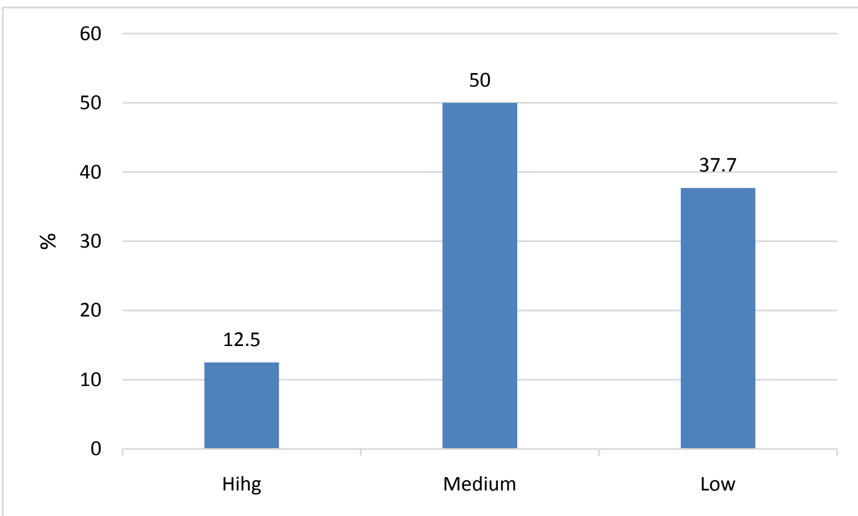

Figure 8. Productivity indicators of Monitoring areas.

The next fields were separated from the Kyzylkum Desert (10, 11, 12, 13). Kyzylkum is a sandy desert in Central Asia. It is located between Amudarya and Syrdarya (Uzbekistan, Kazakhstan, Partly Turkmenistan). It is bordered to the northwest by the Aral Sea, and to the East by the Tianshan and Pamir olay mountaineering. The total area is 300 thousand km^2. Most of its territory consists of Plains. The Kyzylkum Desert is widely used for animal husbandry.

The annual precipitation in this region is around 80 - 120 mm. This condition also sees its effect on the yield indicator of tubers. Although the total number of tubers in this area is large, their mass has a very small value (28.6 - 40.6 grams) (**Figure 9**).

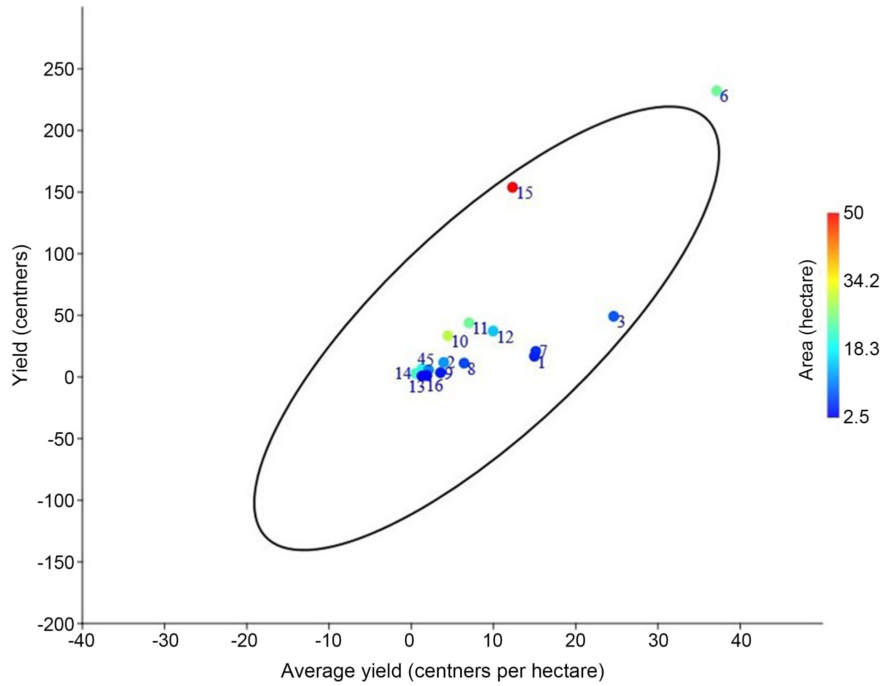

Figure 9. Average yield of *Poa bulbosa* L.

16 areas were separated from the Fergana Valley area. Fergana Valley—a valley located between the mountains of Central Asia is one of the major foothills of Central Asia, surrounded by Tianshan to the North and Hisor-olay mountaineering to the South. It is located mainly in the territory of Uzbekistan, Partly on the territory of the Kyrgyz and Tajik Republics. During the studies, it was found that the number of tubers in an area of 10 × 10 is 64.9, and the weight of one Bush is 44.9 grams. In these regions, too, a lot of livestock was raised.

In the areas separated from the Turkestan mountain range and the Nurota range, it was observed that the total yield was around 15399.7 - 23222.0 kg. During the year in these regions, the amount of precipitation was observed to be around 350 - 500 mm. It was found that this condition optimally affects the development of plants. These fields are 2 and makeup 12.5% of the identified fields. The average yield value was determined based on indicators ranging from 1 ton to 10 tons. The areas with the average are 8, making up 50% of the total areas. Areas with low yields make up 37.7% of the total area. The decline in productivity, in turn, depends on several different factors.

5. Conclusions

The concept of eatability with different grazing methods, the availability of feed, and the state of health of the herd should not be unambiguous. It is customary to characterize the eating of plants based on nutritional value expressed in feed units and the amount of protein, sometimes taking into account the specific characteristics of animals.

The results obtained on the natural reserves of species of significant economic importance indicate that the territories with reserve value in 16 regions recorded with the participation of the *Poa bulbosa* type are the Oriklisoy area of Turkestan mountaineering (23222.0 kg), the territory of the Anchor Village of Khatirchi District (15399.7 kg), the territory of the village. These indicators are explained by the fact that the areas separated from the Protected Areas of the apricot and the Kentala and anchor villages have low anthropogenic impact indicators, in turn, the factors of the external environment in the regions are moderate for the plant.

The low reserve value indicators of *Poa bulbosa* are explained by the fact that the Konimex district corresponds to the Zafarabad town of Kokchatau (80.8 kg), the region of the village of Vodil (118.6 kg) of Fergana region, the Forish District of Egarbeltau (287.0 kg), the indicator of anthropogenic impact (tireless, unplanned grazing of livestock) in these regions is extremely high.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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